

In the Drawings

Please substitute the enclosed formal drawing Figs. 1-14, marked "Replacement Sheets," for the informal drawings originally filed.

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Drawings

Applicants are enclosing formal drawings, Figs. 1-14, marked as "Replacement Sheets" to substitute for the informal drawings originally filed. No new matter has been added. Entry is respectfully requested.

Applicants' invention

The present invention is directed to designing an alternating phase shifting mask for projecting an image of an integrated circuit design, particularly line segments of "critical width." Critical width is explained in the specification at paragraph 0031. In claim 1, the method includes providing a design of an integrated circuit layout having a plurality of essentially parallel segments of critical width; creating essentially parallel alternating phase shifting regions aligned with the critical width segments and extending beyond ends of at least some of the critical width segments; and creating an alternating phase shifting mask based on the alternating phase shifting regions. Program storage device claim 17 and article of manufacture claim 26 incorporate similar method steps and program code means, respectively, as in the method of claim 1.

Independent claim 5 describes the method as providing a design of an integrated circuit layout having a plurality of essentially parallel segments of critical width; enclosing the integrated circuit layout within a boundary; extending lengths of the

critical width segments in the layout; designating alternating phase shifting regions between the extended critical width segments; and creating an alternating phase shifting mask based on the designated alternating phase shifting regions. Program storage device claim 20 and article of manufacture claim 29 incorporate similar method steps and program code means, respectively, as in the method of claim 1.

Independent claim 12 describes the method as providing a design of an integrated circuit layout having a plurality of essentially parallel segments of critical width and regions of non-critical width, with the critical width segments having centerline spacing which is an integer multiple of a minimum pitch. The method then includes enclosing the integrated circuit layout within a boundary; extending lengths of the critical width segments in the layout; designating alternating phase shifting regions between the extended critical width segments; removing from the designated alternating phase shifting regions the regions of non-critical width; and creating an alternating phase shifting mask based on the designated alternating phase shifting regions.

Rejection under 35 USC § 102

Claim 1 stands rejected under 35 USC § 102 as being anticipated by Lin et al. U.S. Patent No. 6,492,073. Applicants respectfully traverse this rejection.

The Lin et al. patent cited by the Examiner is directed to the correction of line end shortening in images caused by optical proximity effects. Lin accomplishes this by using two masks: one mask has a pattern of the line elements, along with line extensions of the line elements, and a second mask has a pattern of transparent regions with cutting patterns enclosing the line extensions in the first mask pattern and corresponding to the ends of the original line elements.

Lin is not directed to the manufacture or use of phase shifting masks, nor is it concerned with creating an alternating phase shifting mask for designs of integrated circuit segments of critical width. The Examiner has made no representation that the use of alternating phase shifting segments in connection with line segments of critical dimension is somehow taught by or inherent in Lin. Since applicants' claim 1 requires providing integrated circuit design segments of critical width, Lin cannot be said to anticipate this claim. Moreover, applicants' claim 1 requires the creation of alternating phase shifting regions aligned with the critical width segments and extending beyond ends of at least some of the critical width segments. Any teaching or suggestion of creating or designating of such alternating phase shifting regions is also absent from Lin. Accordingly, applicants submit Lin does not anticipate claim 1.

Rejection under 35 USC § 103

Claims 1-34 stand rejected under 35 USC § 103 as being obvious from Fukuda U.S. Patent No. 6,811,954 or Liu U.S. Patent No. 6,944,844 in view of Lin et al. U.S. Patent No. 6,492,073. Applicants respectfully traverse this rejection.

The Liu patent is concerned with line end shortening in integrate circuits, particularly that of gate ends extending beyond the diffusion regions in a transistor. Liu describes a method of simulating the printing of such gate ends, but does not disclose or suggest the use of alternating phase shifting regions in an alternating phase shifting mask in connection with any critical width segments.

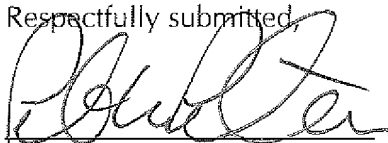
The Fukuda patent is directed to the use of phase shifting masks in manufacturing integrated circuit devices, and particularly to avoiding and resolving conflicts in phase shifting regions when exposing wiring and other patterns on a wafer. Fukuda deals with conflicts in dark-field alternating phase shifting masks, i.e., where the

phase is assigned to the drawn shape as opposed to the background of the shape as in the bright field alternating phase shifting mask techniques in the present invention. The patent discloses methods of resolving such conflicts in L and T shaped and other crossing patterns where conflicts arise.

Fukuda does not disclose either creating alternating phase shifting regions aligned with the critical width segments and extending beyond ends of at least some of the critical width segments (claims 1, 17 and 26) or designating alternating phase shifting regions between the extended critical width segments (claims 5, 12, 20 and 29). Since Lin does not remedy the deficiencies of Liu or Fukuda in this regard, for the reasons given above, applicants' claims 1-34 are not *prima facie* obvious to one of ordinary skill in the art since the references in combination do not disclose all of the limitations of the instant claims.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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